

The AgMIP Coordinated Global and Regional Assessments (CGRA) of Climate Change Impacts on Agriculture and Food Security



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Views expressed are those of the author, and don't necessarily represent those of NASA

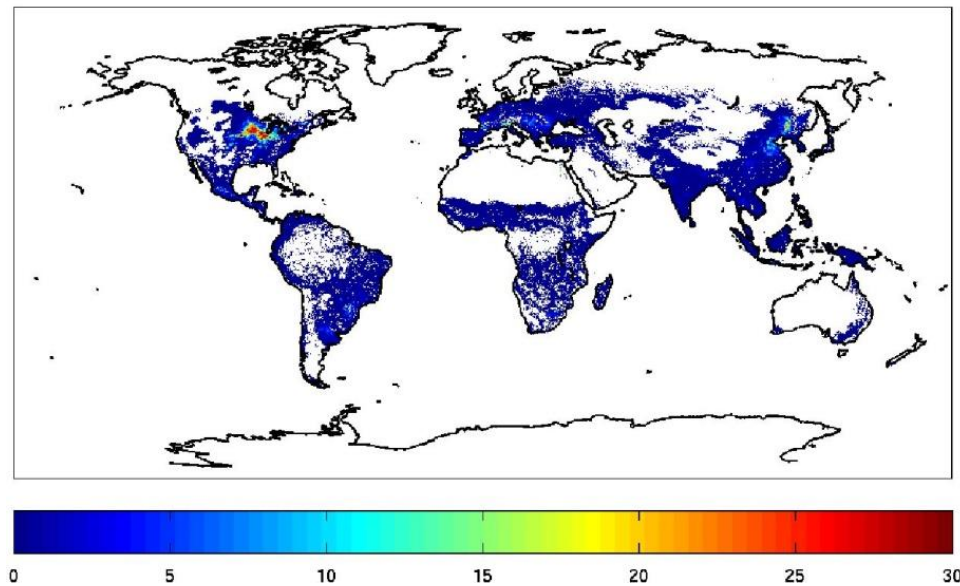


Goddard Institute for Space Studies
New York, N.Y.



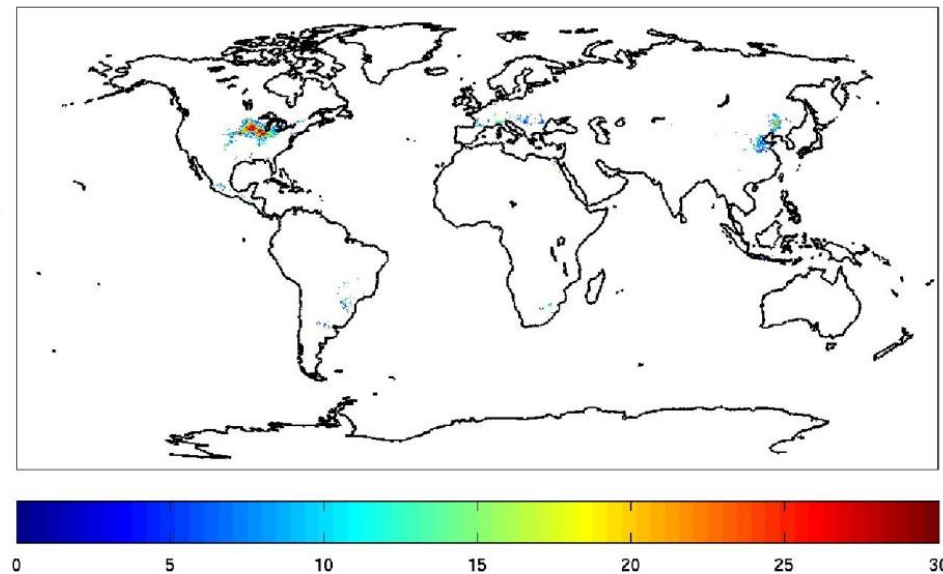
CENTER FOR CLIMATE
SYSTEMS RESEARCH
THE EARTH INSTITUTE AT COLUMBIA UNIVERSITY

All Maize Production (1000s of kg)



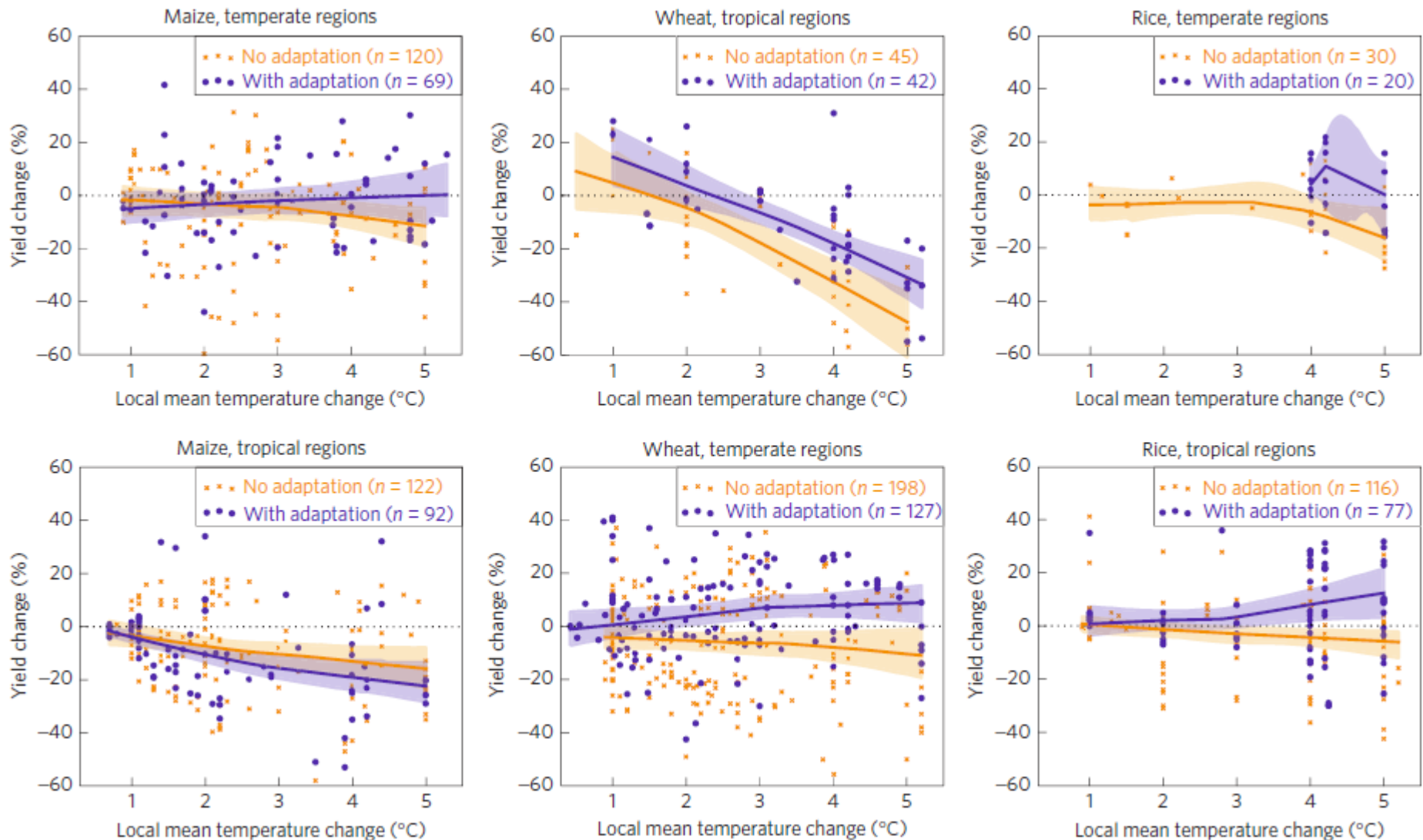
Data from Monfreda et al., 2002

Top Regions Accounting for 90% of World Maize Production



Crop Responses are Not Clear

(Meta-analysis by Challinor et al.,
Nature Climate Change and IPCC WG2)



Difficult to make sense out of incredibly diverse studies

The image shows a vibrant, terraced agricultural landscape. In the foreground, there are lush green rice paddies. To the left, a dense patch of tall corn plants stands out. Three people are visible in the lower-middle ground, working in the rice fields; one is wearing a white shirt and a light-colored hat, while the other two are in red clothing. The background consists of more terraced fields, some with corn and others with rice, leading up to a dense forest of tall trees. The overall scene is a testament to traditional agricultural practices in a mountainous region.

The Agricultural Model Intercomparison and Improvement Project (AgMIP)



1st Global Oct 2010



2nd Global Oct 2011



4th Global Oct 2013



5th Global Feb 2015



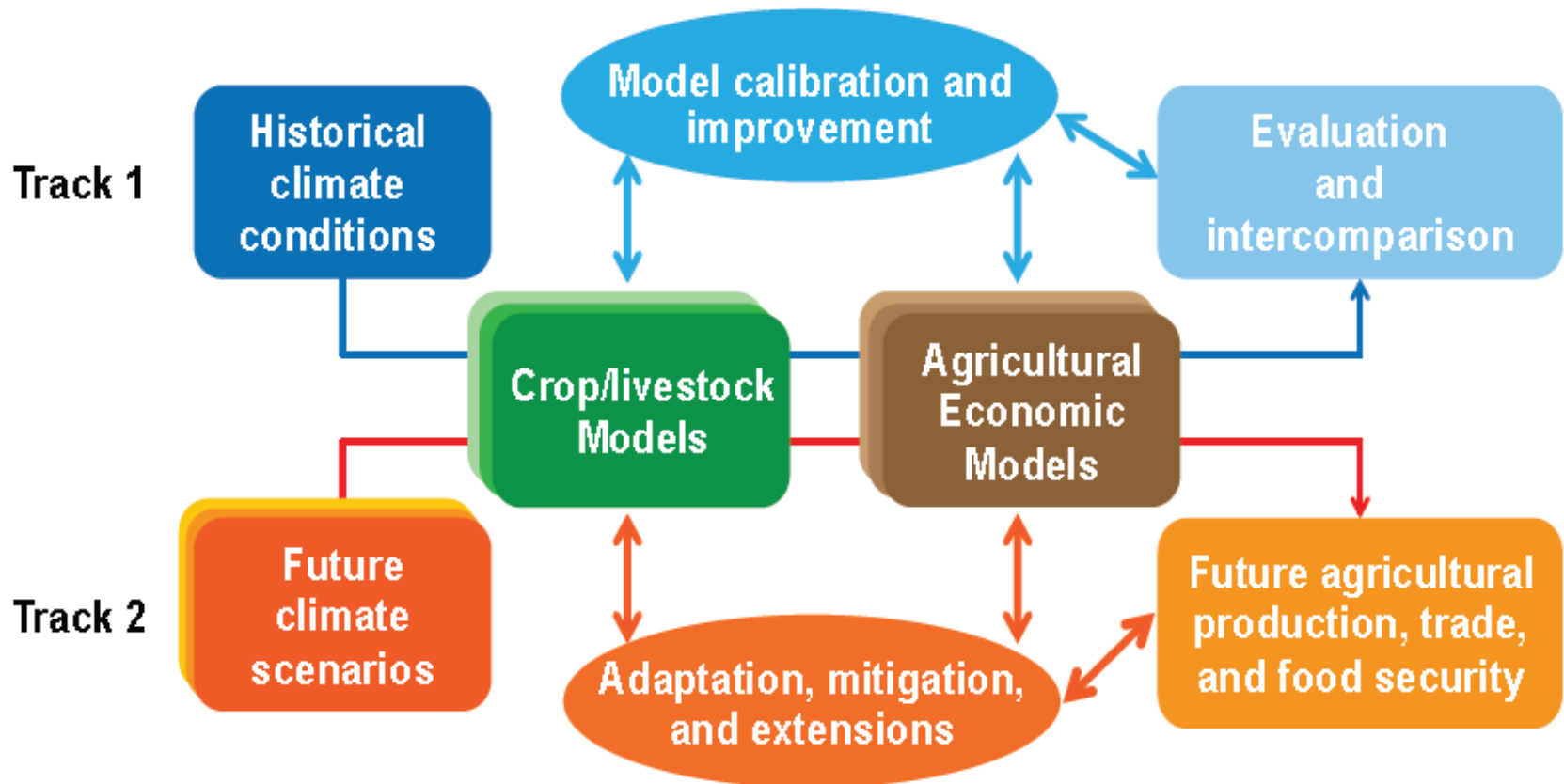
Sub-Saharan Africa #3



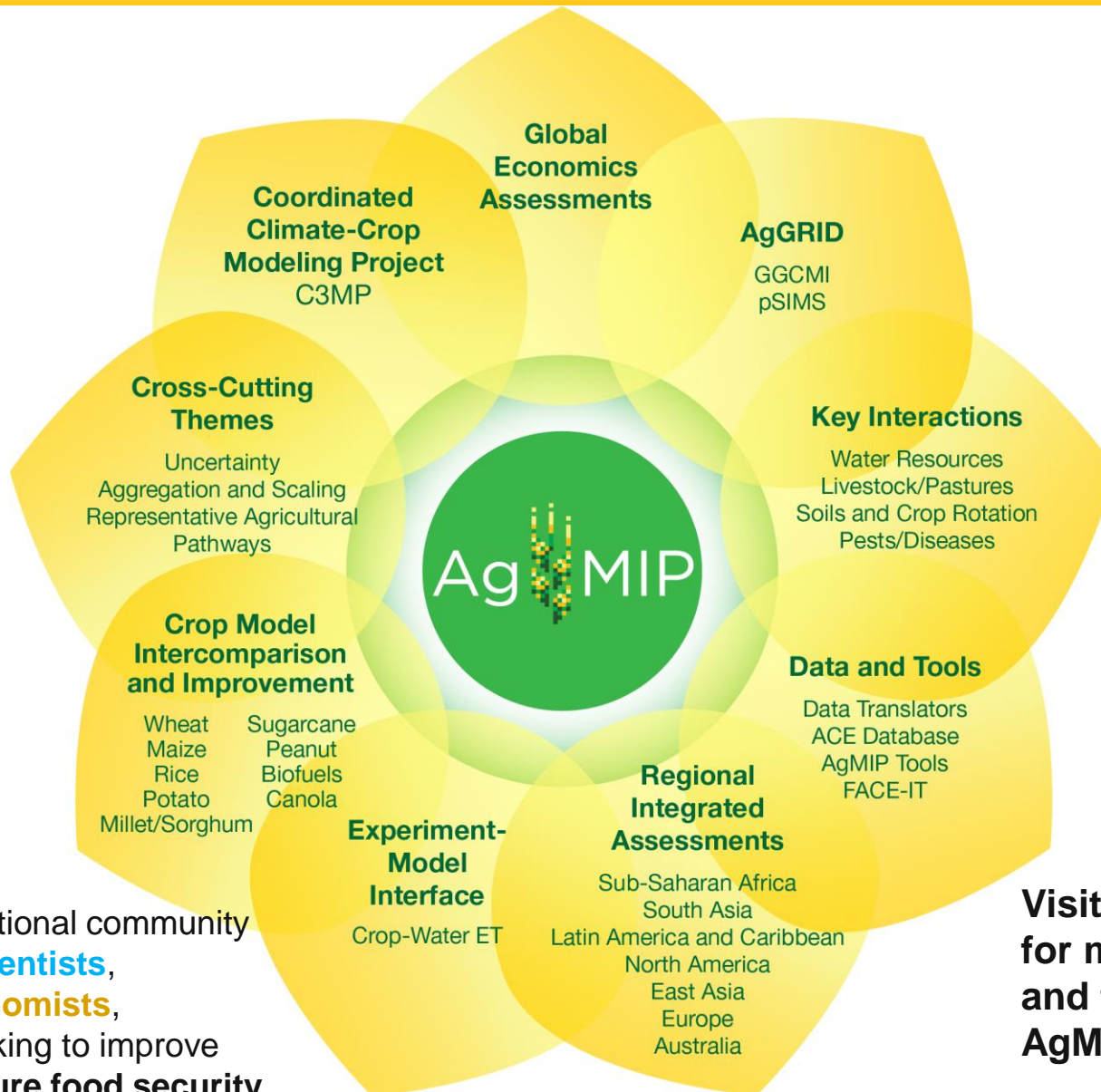
South Asia #3



3rd Global Oct 2012

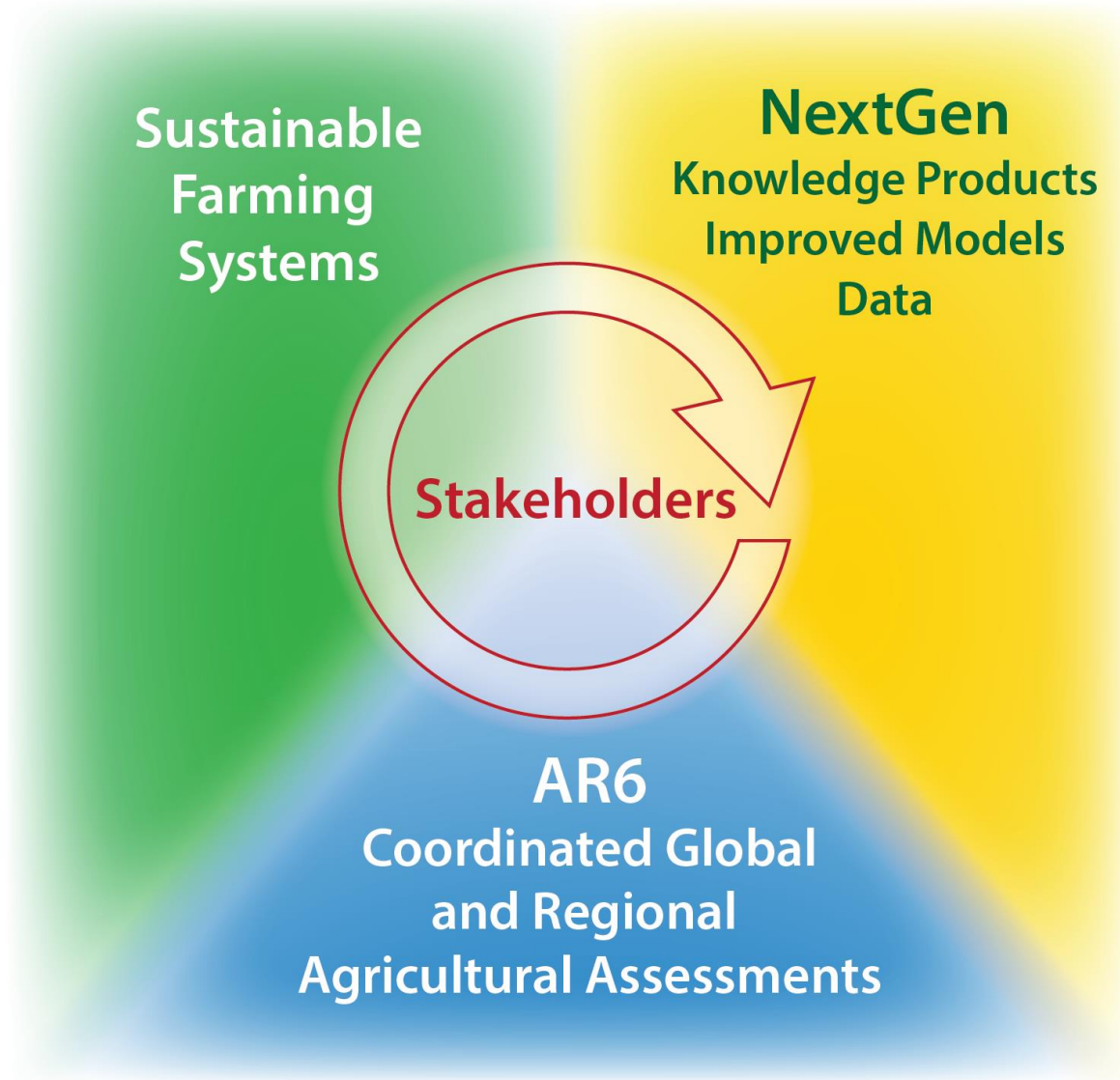


Rosenzweig et al., 2013 AgForMet



AgMIP is an international community of 800+ **climate scientists**, **agronomists**, **economists**, and **IT experts** working to improve assessments of **future food security**

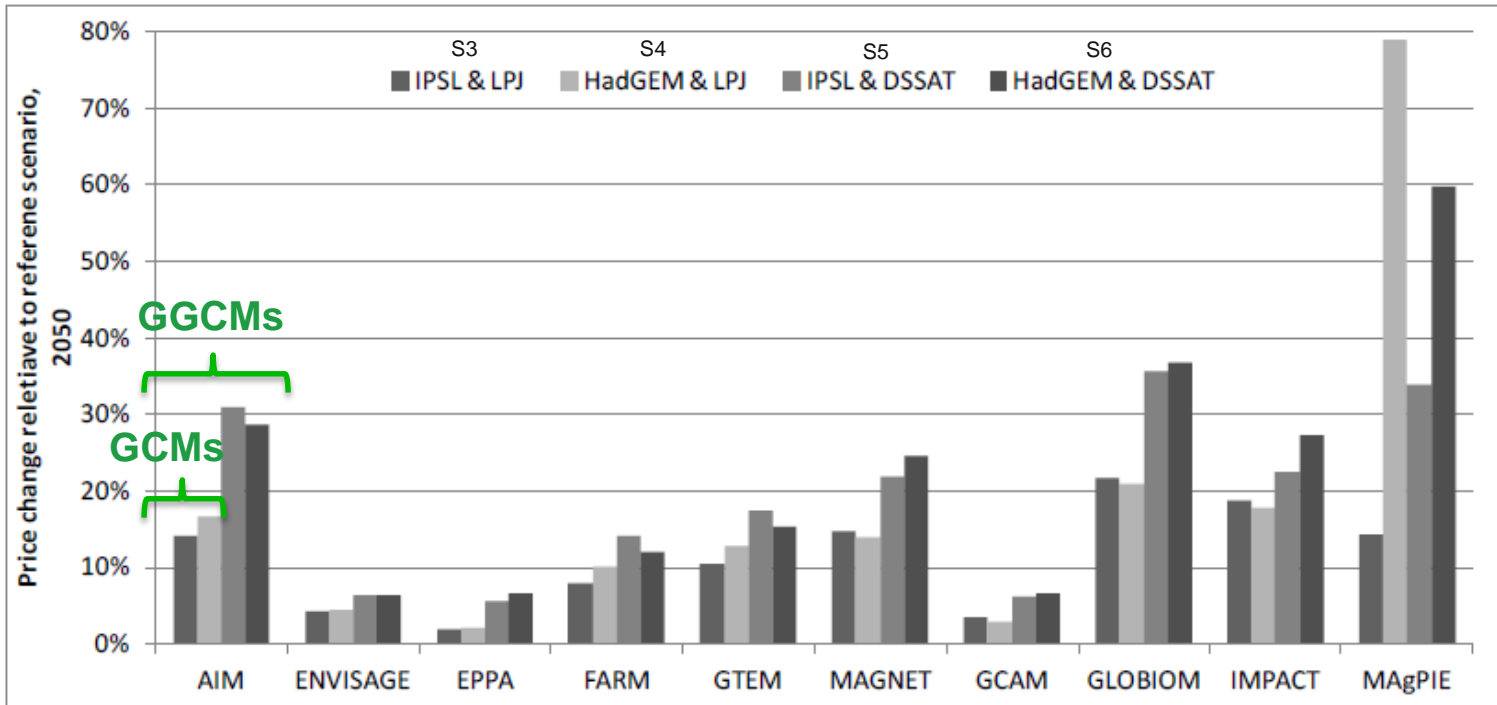
Visit www.agmip.org for more information and to sign up for AgMIP listserv 7



Constructing a Framework for Global Assessment



Effects of climate change on agricultural prices (2050 RCP8.5 relative to results without climate change in 2050)



Source: Model results as of February 15, 2013

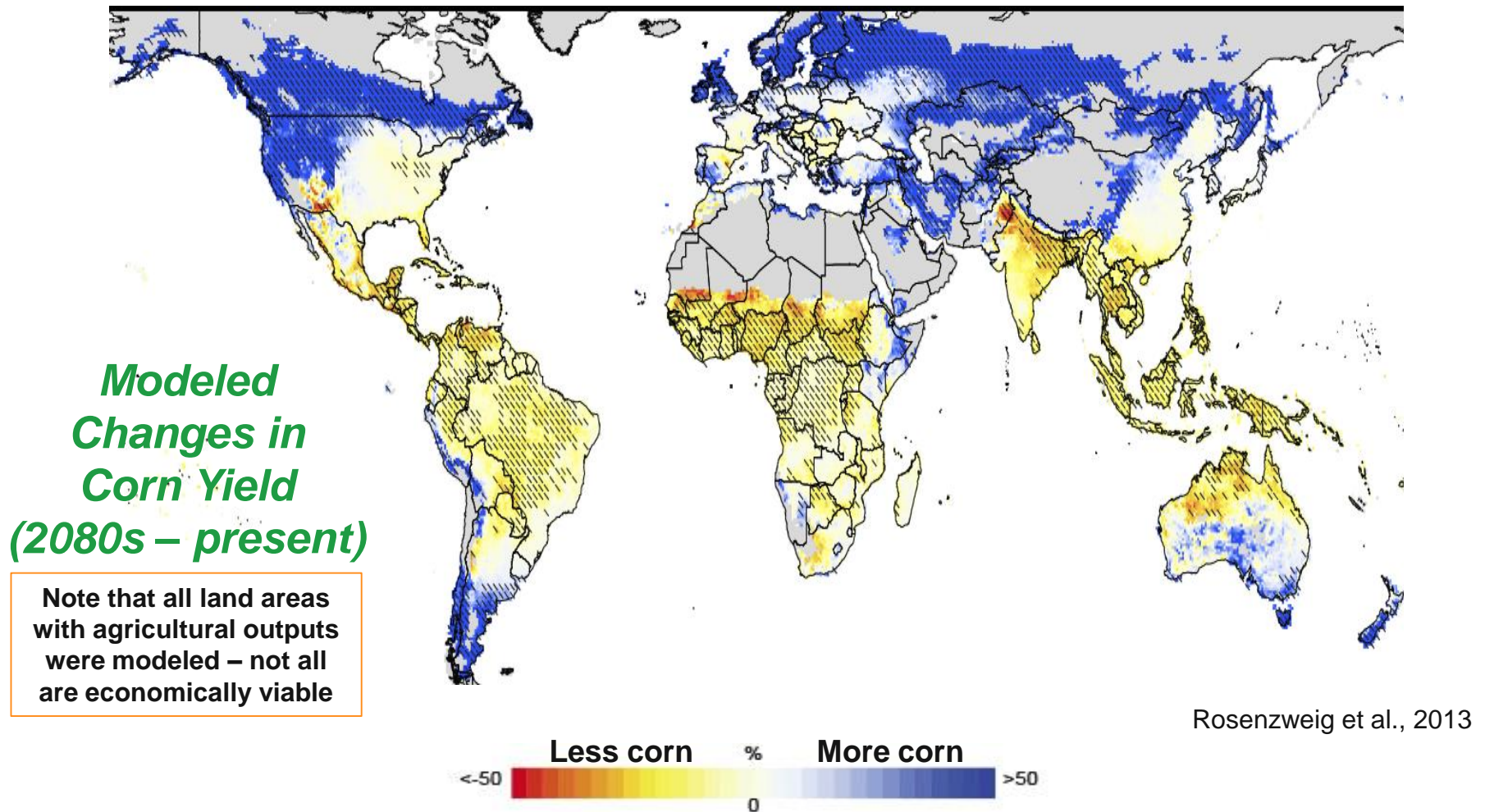
Note: All changes relative to the reference scenario for the same year.

AgMIP Global Economics Model Intercomparison

10 Global Economics Models, 2 GCMs, 2 crop models

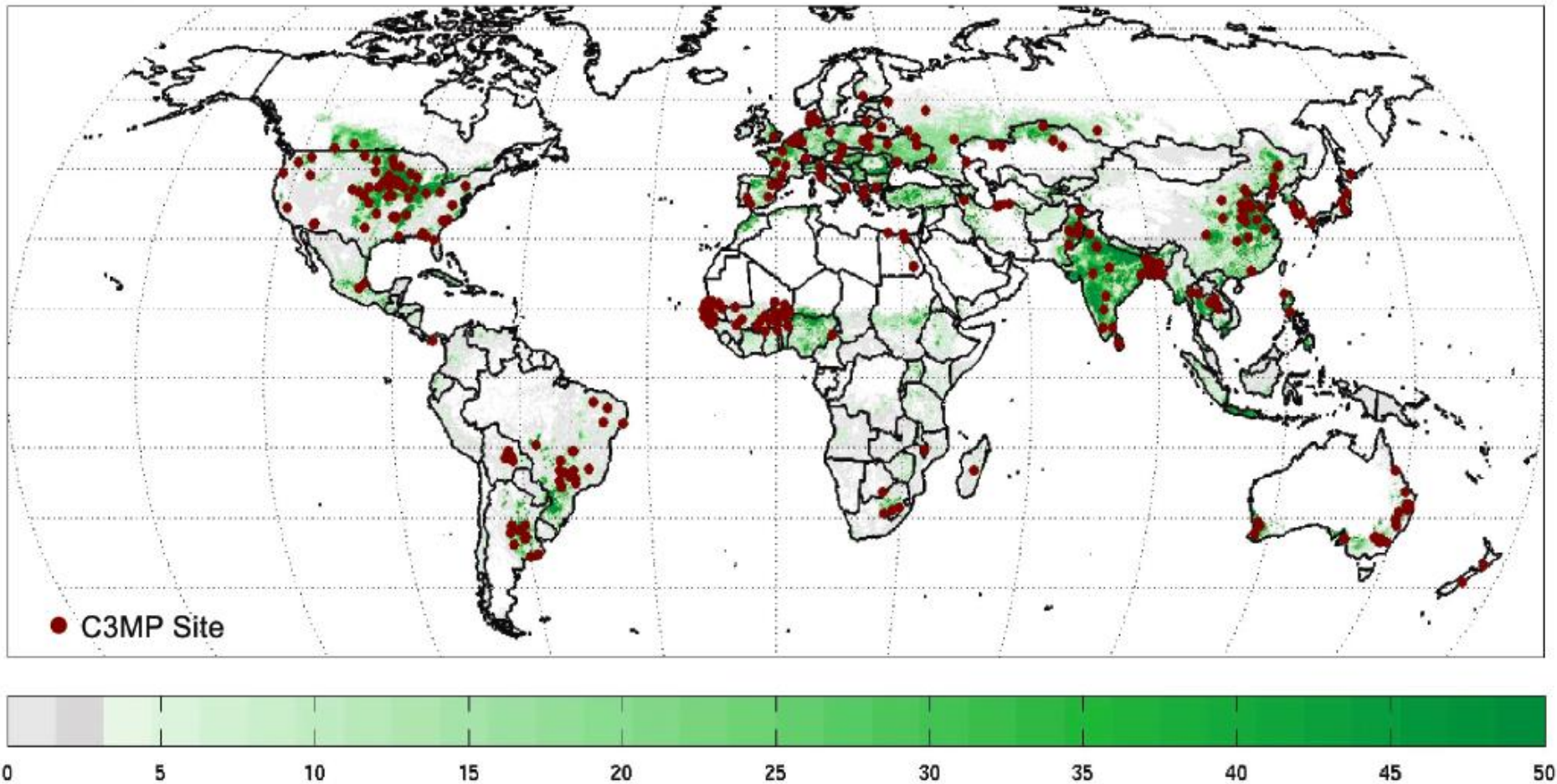
Von Lampe et al., *Agricultural Economics*, 2013

Baseline from SSP2



5 GCMs, 7 GGCMs; hatched = 70% agreement in sign of change

All C3MP Submitted Sites and Major Croplands (Percentage Area)



● C3MP submitted site (1137 sites as of August, 2015)

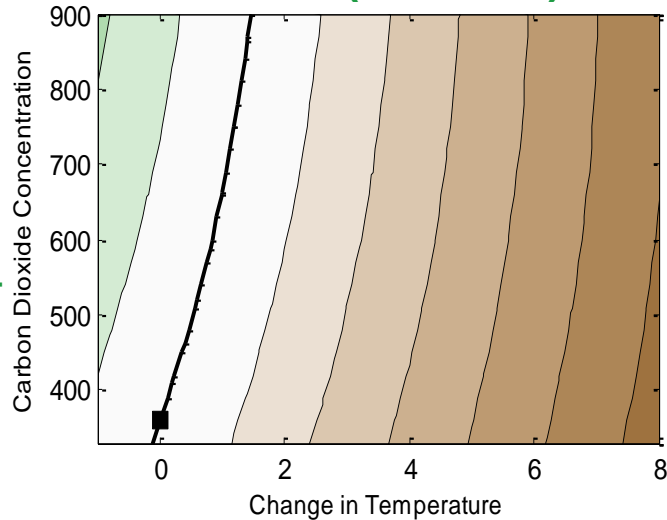
The AgMIP Coordinated Climate-Crop Modeling Project (C3MP): Methods and Protocols

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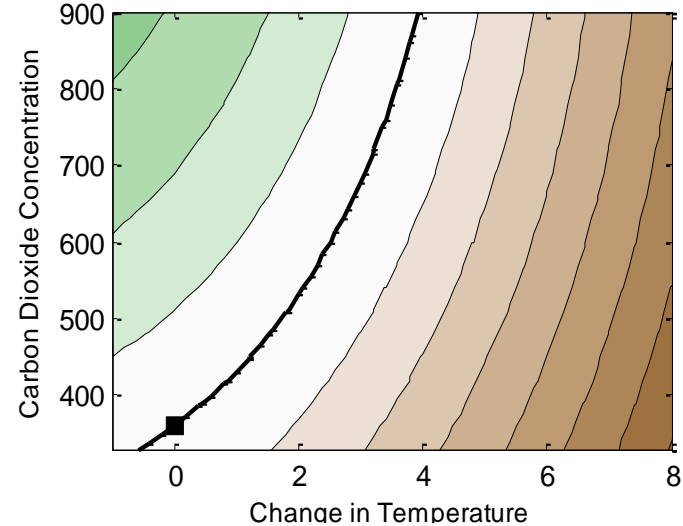
Crop responses vary by species

(C3MP – Ruane et al., 2013; Mavromatis et al., Forthcoming)

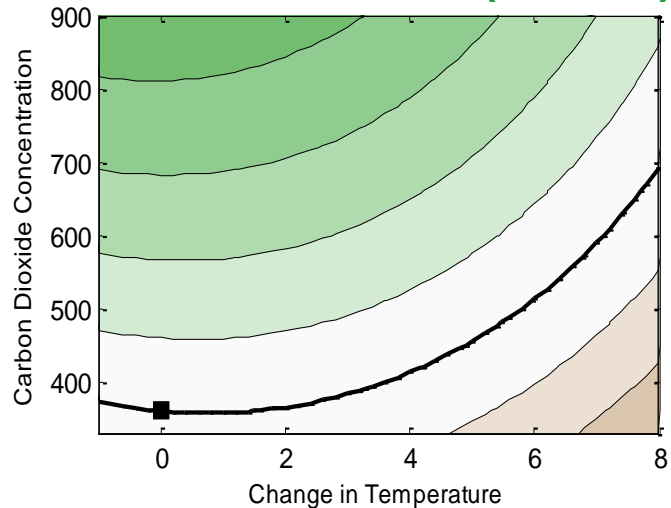
Maize (135 sets)



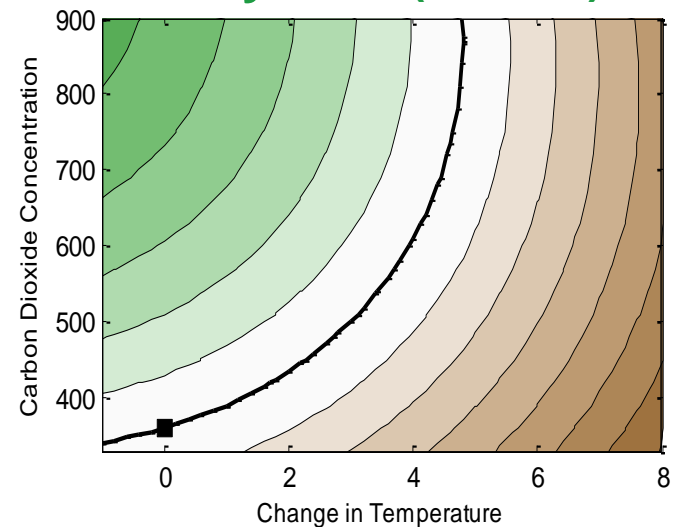
Rice (48 sets)



Winter Wheat (75 sets)



Soybean (92 sets)



Note:
Rain-fed
results
shown for all
species

AgMIP Coordinated Global and Regional Assessments of Climate Impacts on Agriculture and Food Security

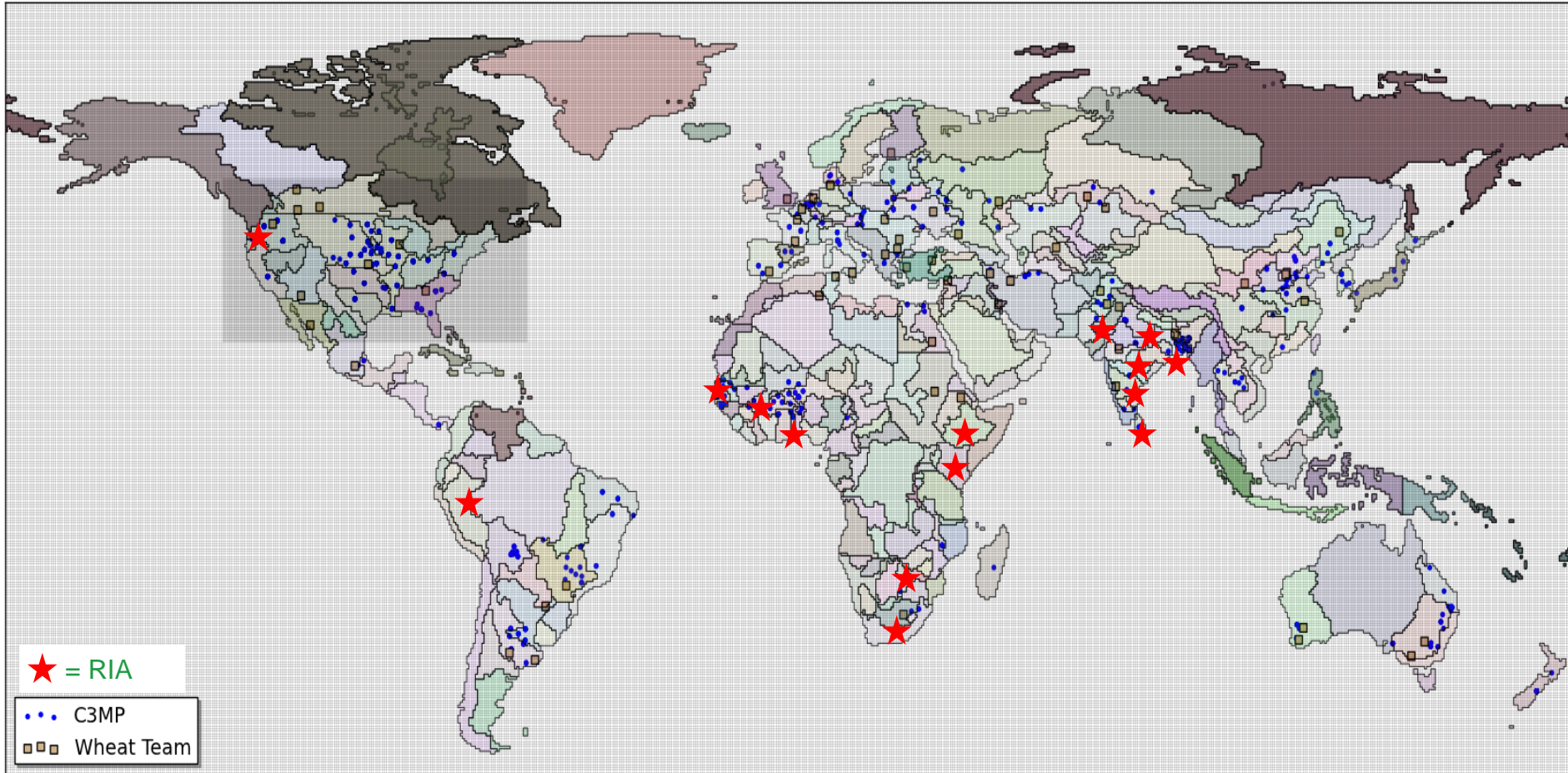




Aspen Global Change Institute –
September, 2015

Core Question: How can we manage risks of and develop resilience to extreme weather, climate change, and other disruptions for agricultural production and food security, now and in the future ?

- **Question #1:** What are the capabilities of and limits to adaptation to extreme weather and climate change, now and in the future?
 - **Key Topics:** Technology trends vs specific adaptation strategies; Management; Genetics
- **Question #2:** What are the effects of agricultural mitigation policies, now and in the future?
 - **Key Topics:** Effects on land use and prices; Biofuels; Soil carbon
- **Question #3:** How does extreme weather and climate change affect food security/nutrition, now and in the future?
 - **Key Topics:** Availability; Access; Utilization/diet; Stability
- **Question #4:** How do policies affect agricultural production and food security, now and in the future?
 - **Key Topics:** Trade; Governance; Property rights; Institutions; Water; Land;



Grids = Global and regional crop models; Polygons = Food-producing units

TOA-MD has 100+ users around the world

Building Blocks to allow telescopic scales, feedbacks, and details

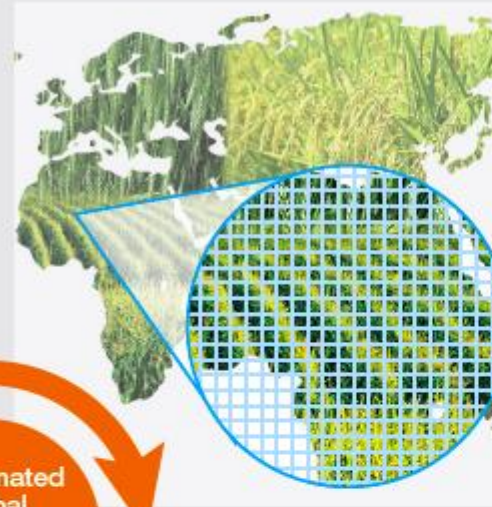
Regional research

on farming systems using biophysical and socioeconomic models



High-resolution gridded crop modeling

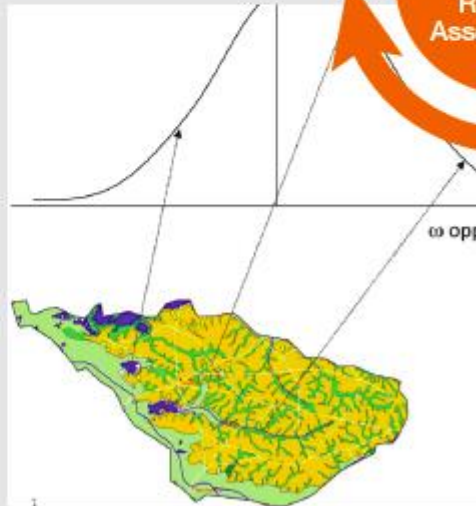
for gap-filling and aggregation in each region



Coordinated Global and Regional Assessments

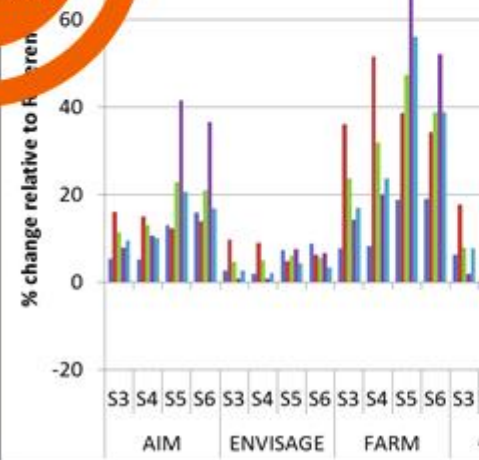
Production systems and regional economics

to respond to price changes

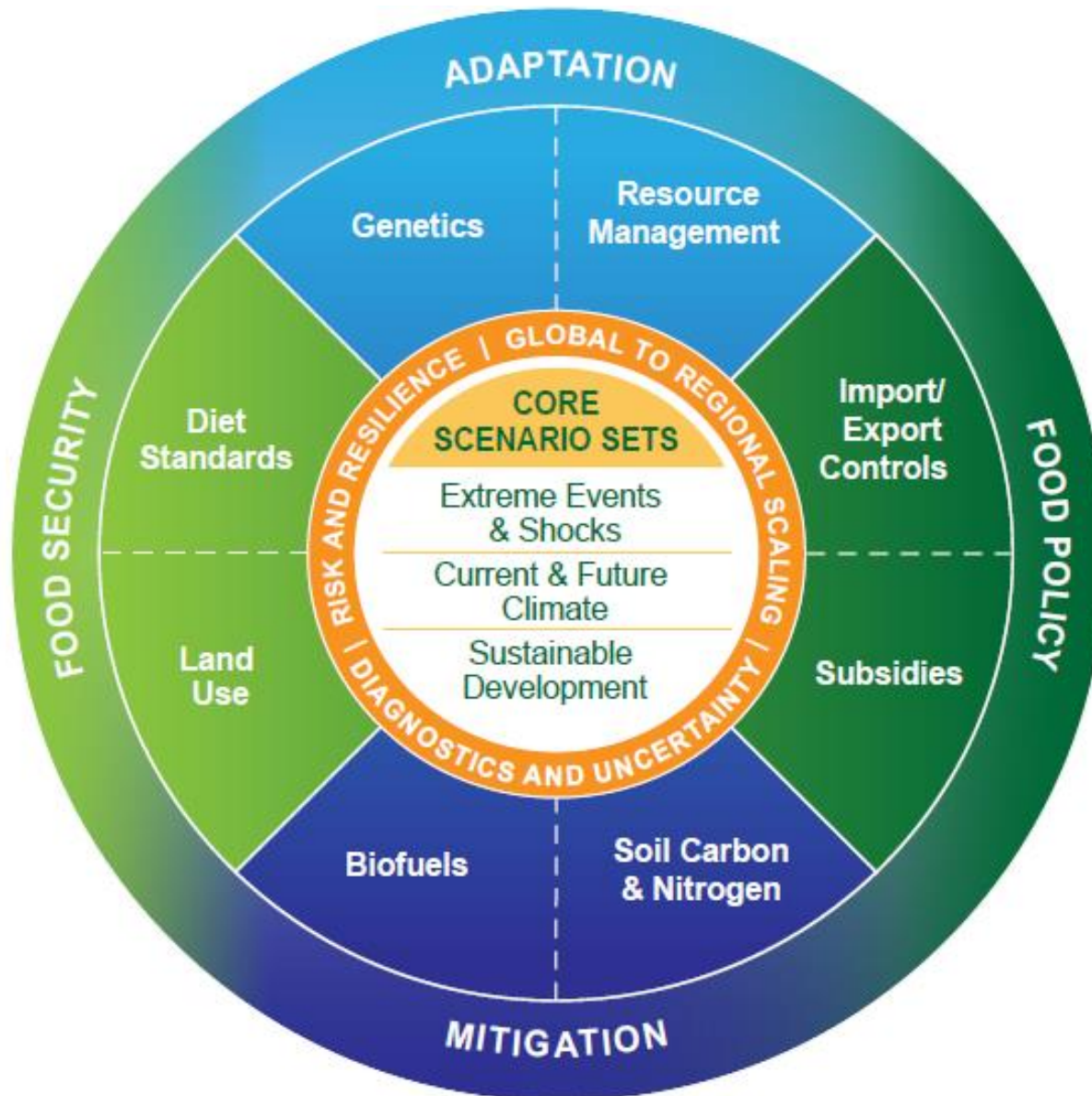


Global economics

with analysis of world and regional prices



CGRA Scenario Sets – Core Risk and Resilience Framing



- **Disciplinary linkages:** Linked biophysical and economic models
- **Scale linkages:** Consistency from local to global scales
- **Resolution of human outcomes:** Connections to nutrition and health
- **Continuum of time scales:**
current variability and extremes
near- and long-term outlooks
- **Scenarios** of adaptation, mitigation,
food policy, and food security



Concluding Thoughts



- AgMIP Projects and Partners use cutting-edge model, data, and IT approaches to understand resilience, sustainability, and productivity of farming systems and agricultural economies in support of stakeholder decisions from regional to global scales.
- The AgMIP community has grown in the last 5+ years, and participants are eager to demonstrate the use of models for the testing of sustainable solutions and informed decision making
- AgMIP tools could play a role in identifying and prioritizing food security solutions in diverse communities.
- AgMIP's Coordinated Global and Regional Assessments of Climate Impacts on Agriculture and Food Security will provide cutting-edge assessments – **Join us!!**



Thanks!

More info: www.agmip.org

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